

## TENT COOPÉRATION TREATY

PCT

NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

HOFSETH, Svein  
Norsk Hydro ASA  
N-0240 Oslo  
NORVÈGE

Date of mailing (day/month/year) 10 August 2000 (10.08.00)	
Applicant's or agent's file reference P9948	<b>IMPORTANT NOTIFICATION</b>
International application No. PCT/NO00/00221	International filing date (day/month/year) 26 June 2000 (26.06.00)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 25 June 1999 (25.06.99)
Applicant NORSK HYDRO ASA et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
25 June 1999 (25.06.99)	19993157	NO	11 July 2000 (11.07.00)

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

S. De Michiel

Telephone No. (41-22) 338.83.88

## PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

<b>Date of mailing</b> (day/month/year) 12 March 2001 (12.03.01)	
<b>International application No.</b> PCT/NO00/00221	<b>Applicant's or agent's file reference</b> P9948
<b>International filing date</b> (day/month/year) 26 June 2000 (26.06.00)	<b>Priority date</b> (day/month/year) 25 June 1999 (25.06.99)
<b>Applicant</b> JOHANSEN, Inge et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

17 January 2001 (17.01.01)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland	<b>Authorized officer</b>  Claudio Borton
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicants or agents for reference		<b>FOR FURTHER ACTION</b>		See Notification of Transmittal of International Preliminary Examination Report of form PCT/IPC A-416.
P9948				
International application No.	International filing date (day month year)	Priority date (day month year)		
PCT/NO00/00221	26 06 2000	25 06 1999		
International Patent Classification (IPC) or national classification and IPC				
B22D11/04				
Applicant				
NORSK HYDRO ASA et al.				

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36


2. This REPORT consists of a total of 6 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and or drawings which have been amended and are the basis for this report and or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 1 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
17/01/2001	05/10/2001
Name and mailing address of the international preliminary examining authority	Authorized officer
 European Patent Office D-80298 Munich Tel: +49 89 2399-111 Fax: +49 89 2399-111 Fax: +49 89 2399-4465	Lombors, T Telephone No: +49 89 2399-4465



**RECORD COPY**

**PCT**

**REQUEST**

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

**PCT/NO 00 / 00221**  
International Application No

**26 JUNI 2000 (26 06 - 2000)**

International Filing Date



**PATENTSTYRET**

Styret for det industrielle rettsvern  
► PCT International application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) P9948

**Box No. I TITLE OF INVENTION**

**EQUIPMENT FOR CONTINUOUS, HORIZONTAL CASTING OF METAL**

**Box No. II APPLICANT**

Name and address (Family name followed by given name, for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

NORSK HYDRO ASA  
N-0240 OSLO  
NORWAY

☐ This person is also inventor

Telephone No  
47-22-432100

Facsimile No  
47-22-432308

Teleprinter No

State (that is, country) of nationality  
NO

State (that is, country) of residence  
NO

This person is applicant  
for the purposes of

☐ all designated  
States

☒ all designated States except  
the United States of America

☐ the United States  
of America only

☐ the States indicated in  
the Supplemental Box

**Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

Name and address (Family name followed by given name, for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

JOHANSEN, Inge  
Håsenveien 35  
N-6600 Sunndalsora  
Norway

This person is

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box  
is marked, do not fill in below.)

State (that is, country) of nationality  
NO

State (that is, country) of residence  
NO

This person is applicant  
for the purposes of

☐ all designated  
States

☐ all designated States except  
the United States of America

☒ the United States  
of America only

☐ the States indicated in  
the Supplemental Box

☒ Further applicants and or (further) inventors are indicated on a continuation sheet

**Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The person identified below is hereby has been appointed to act on behalf  
of the applicant(s) before the competent International Authorities as

☒ agent

☐ common representative

Name and address (Family name followed by given name, for a legal entity, full official designation. The address must include postal code and name of country.)

HOFSETH, Svein  
Norsk Hydro ASA  
N-0240 Oslo  
Norway

Telephone No  
47-22-432903

Facsimile No  
47-22-432308

Teleprinter No

☐ Address for correspondence: Mark this check-box where no agent or common representative is has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent

## Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

*If none of the following sub-boxes is used, this sheet should not be included in the request.*

Name and address (Family name followed by given name, for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

MÆLAND, Geir  
Bruflata 2  
N-6600 Sunndalsøra  
Norway

This person is

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality  
NO

State (that is, country) of residence  
NO

This person is applicant for the purposes of

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

Name and address (Family name followed by given name, for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

STRØMSVÅG, Åge  
Einangveien 11 E  
N-6600 Sunndalsøra  
Norway

This person is

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality  
NO

State (that is, country) of residence  
NO

This person is applicant for the purposes of

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

Name and address (Family name followed by given name, for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is

☐ applicant only

☐ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality

State (that is, country) of residence

This person is applicant for the purposes of

☐ all designated States

☐ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

Name and address (Family name followed by given name, for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is

☐ applicant only

☐ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality

State (that is, country) of residence

This person is applicant for the purposes of

☐ all designated States

☐ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

☐ Further applicants and or (further) inventors are indicated on another continuation sheet

**Box No.V DESIGNATION OF STATES**

The following designations are hereby made under Rule 4 9(a) *(mark the applicable check-boxes, at least one must be marked)*

**Regional Patent**

- ☒ **AP ARIPO Patent:** **GH** Ghana, **GM** Gambia, **KE** Kenya, **LS** Lesotho, **MW** Malawi, **SD** Sudan, **SL** Sierra Leone, **SZ** Swaziland, **TZ** United Republic of Tanzania, **UG** Uganda, **ZW** Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA Eurasian Patent:** **AM** Armenia, **AZ** Azerbaijan, **BY** Belarus, **KG** Kyrgyzstan, **KZ** Kazakhstan, **MD** Republic of Moldova, **RU** Russian Federation, **TJ** Tajikistan, **TM** Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP European Patent:** **AT** Austria, **BE** Belgium, **CH and LI** Switzerland and Liechtenstein, **CY** Cyprus, **DE** Germany, **DK** Denmark, **ES** Spain, **FI** Finland, **FR** France, **GB** United Kingdom, **GR** Greece, **IE** Ireland, **IT** Italy, **LU** Luxembourg, **MC** Monaco, **NL** Netherlands, **PT** Portugal, **SE** Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA OAPI Patent:** **BF** Burkina Faso, **BJ** Benin, **CF** Central African Republic, **CG** Congo, **CI** Côte d'Ivoire, **CM** Cameroon, **GA** Gabon, **GN** Guinea, **GW** Guinea-Bissau, **ML** Mali, **MR** Mauritania, **NE** Niger, **SN** Senegal, **TD** Chad, **TG** Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)*

**National Patent** *(if other kind of protection or treatment desired, specify on dotted line)*

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> <b>AE</b> United Arab Emirates                  | <input checked="" type="checkbox"/> <b>LR</b> Liberia                                   |
| <input checked="" type="checkbox"/> <b>AL</b> Albania                               | <input checked="" type="checkbox"/> <b>LS</b> Lesotho                                   |
| <input checked="" type="checkbox"/> <b>AM</b> Armenia                               | <input checked="" type="checkbox"/> <b>LT</b> Lithuania                                 |
| <input checked="" type="checkbox"/> <b>AT</b> Austria                               | <input checked="" type="checkbox"/> <b>LU</b> Luxembourg                                |
| <input checked="" type="checkbox"/> <b>AU</b> Australia                             | <input checked="" type="checkbox"/> <b>LV</b> Latvia                                    |
| <input checked="" type="checkbox"/> <b>AZ</b> Azerbaijan                            | <input checked="" type="checkbox"/> <b>MA</b> Morocco                                   |
| <input checked="" type="checkbox"/> <b>BA</b> Bosnia and Herzegovina                | <input checked="" type="checkbox"/> <b>MD</b> Republic of Moldova                       |
| <input checked="" type="checkbox"/> <b>BB</b> Barbados                              | <input checked="" type="checkbox"/> <b>MG</b> Madagascar                                |
| <input checked="" type="checkbox"/> <b>BG</b> Bulgaria                              | <input checked="" type="checkbox"/> <b>MK</b> The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> <b>BR</b> Brazil                                |   |
| <input checked="" type="checkbox"/> <b>BY</b> Belarus                               | <input checked="" type="checkbox"/> <b>MN</b> Mongolia                                  |
| <input checked="" type="checkbox"/> <b>CA</b> Canada                                | <input checked="" type="checkbox"/> <b>MW</b> Malawi                                    |
| <input checked="" type="checkbox"/> <b>CH and LI</b> Switzerland and Liechtenstein  | <input checked="" type="checkbox"/> <b>MX</b> Mexico                                    |
| <input checked="" type="checkbox"/> <b>CN</b> China                                 | <input checked="" type="checkbox"/> <b>NO</b> Norway                                    |
| <input checked="" type="checkbox"/> <b>CR</b> Costa Rica                            | <input checked="" type="checkbox"/> <b>NZ</b> New Zealand                               |
| <input checked="" type="checkbox"/> <b>CU</b> Cuba                                  | <input checked="" type="checkbox"/> <b>PL</b> Poland                                    |
| <input checked="" type="checkbox"/> <b>CZ</b> Czech Republic                        | <input checked="" type="checkbox"/> <b>PT</b> Portugal                                  |
| <input checked="" type="checkbox"/> <b>DE</b> Germany                               | <input checked="" type="checkbox"/> <b>RO</b> Romania                                   |
| <input checked="" type="checkbox"/> <b>DK</b> Denmark                               | <input checked="" type="checkbox"/> <b>RU</b> Russian Federation                        |
| <input checked="" type="checkbox"/> <b>DM</b> Dominica                              | <input checked="" type="checkbox"/> <b>SD</b> Sudan                                     |
| <input checked="" type="checkbox"/> <b>EE</b> Estonia                               | <input checked="" type="checkbox"/> <b>SE</b> Sweden                                    |
| <input checked="" type="checkbox"/> <b>ES</b> Spain                                 | <input checked="" type="checkbox"/> <b>SG</b> Singapore                                 |
| <input checked="" type="checkbox"/> <b>FI</b> Finland                               | <input checked="" type="checkbox"/> <b>SI</b> Slovenia                                  |
| <input checked="" type="checkbox"/> <b>GB</b> United Kingdom                        | <input checked="" type="checkbox"/> <b>SK</b> Slovakia                                  |
| <input checked="" type="checkbox"/> <b>GD</b> Grenada                               | <input checked="" type="checkbox"/> <b>SL</b> Sierra Leone                              |
| <input checked="" type="checkbox"/> <b>GE</b> Georgia                               | <input checked="" type="checkbox"/> <b>TJ</b> Tajikistan                                |
| <input checked="" type="checkbox"/> <b>GH</b> Ghana                                 | <input checked="" type="checkbox"/> <b>TM</b> Turkmenistan                              |
| <input checked="" type="checkbox"/> <b>GM</b> Gambia                                | <input checked="" type="checkbox"/> <b>TR</b> Turkey                                    |
| <input checked="" type="checkbox"/> <b>HR</b> Croatia                               | <input checked="" type="checkbox"/> <b>TT</b> Trinidad and Tobago                       |
| <input checked="" type="checkbox"/> <b>HU</b> Hungary                               | <input checked="" type="checkbox"/> <b>TZ</b> United Republic of Tanzania               |
| <input checked="" type="checkbox"/> <b>ID</b> Indonesia                             | <input checked="" type="checkbox"/> <b>UA</b> Ukraine                                   |
| <input checked="" type="checkbox"/> <b>IL</b> Israel                                | <input checked="" type="checkbox"/> <b>UG</b> Uganda                                    |
| <input checked="" type="checkbox"/> <b>IN</b> India                                 | <input checked="" type="checkbox"/> <b>US</b> United States of America                  |
| <input checked="" type="checkbox"/> <b>IS</b> Iceland                               |   |
| <input checked="" type="checkbox"/> <b>JP</b> Japan                                 | <input checked="" type="checkbox"/> <b>UZ</b> Uzbekistan                                |
| <input checked="" type="checkbox"/> <b>KE</b> Kenya                                 | <input checked="" type="checkbox"/> <b>VN</b> Viet Nam                                  |
| <input checked="" type="checkbox"/> <b>KG</b> Kyrgyzstan                            | <input checked="" type="checkbox"/> <b>YU</b> Yugoslavia                                |
| <input checked="" type="checkbox"/> <b>KP</b> Democratic People's Republic of Korea | <input checked="" type="checkbox"/> <b>ZA</b> South Africa                              |
|   | <input checked="" type="checkbox"/> <b>ZW</b> Zimbabwe                                  |
- ☒ **KR** Republic of Korea
- ☒ **KZ** Kazakhstan
- ☒ **LC** Saint Lucia
- ☒ **LK** Sri Lanka
- ☐ .....
- ☐ .....

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet

**Precautionary Designation Statement:** In addition to the designations made above, the applicant also makes under Rule 4 9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation, including fees, must reach the receiving Office within the 15-month time limit.)*

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box		
Filing date of earlier application (day month year)	Number of earlier application	Where earlier application is		
		national application country	regional application * regional Office	international application receiving Office
item (1) 25 June 1999 (25.06.99)	19993157	Norway		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office identified above as item(s))* 19993157

\* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4 10(b)(iii)). See Supplemental Box.

### Box No. VII INTERNATIONAL SEARCHING AUTHORITY

**Choice of International Searching Authority (ISA)**  
If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used:

ISA SE

**Request to use results of earlier search; reference to that search** (if an earlier search has been carried out by or requested from the International Searching Authority)

Date (day month year)

Number

Country (or regional Office)

### Box No. VIII CHECK LIST: LANGUAGE OF FILING

This international application contains the following number of sheets

request 4  
description (excluding  
sequence listing part) 5  
claims 2  
abstract 1  
drawings 3  
sequence listing part  
of description

Total number of sheets : 15

This international application is accompanied by the item(s) marked below.

- 1 ☒ fee calculation sheet
- 2 ☐ separate signed power of attorney
- 3 ☐ copy of general power of attorney, reference number, if any:
- 4 ☐ statement explaining lack of signature
- 5 ☐ priority document(s) identified in Box No. VI as item(s):
- 6 ☐ translation of international application into (language):
- 7 ☐ separate indications concerning deposited microorganism or other biological material
- 8 ☐ nucleotide and or amino acid sequence listing in computer readable form
- 9 ☒ other (specify) Search Report

Figure of the drawings which  
should accompany the abstract 1

Language of filing of the  
international application: Norwegian

### Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

  
Svein Hofseth

For receiving Office use only

1 Date of actual receipt of the purported international application <b>26 JUNI 2000 (26.06.2000)</b>	2 Drawings <input checked="" type="checkbox"/> received <input type="checkbox"/> not received
3 Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
4 Date of timely receipt of the required corrections under PCT Article 11(2)	
5 International Searching Authority (if two or more are competent) ISA SE	6 <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid

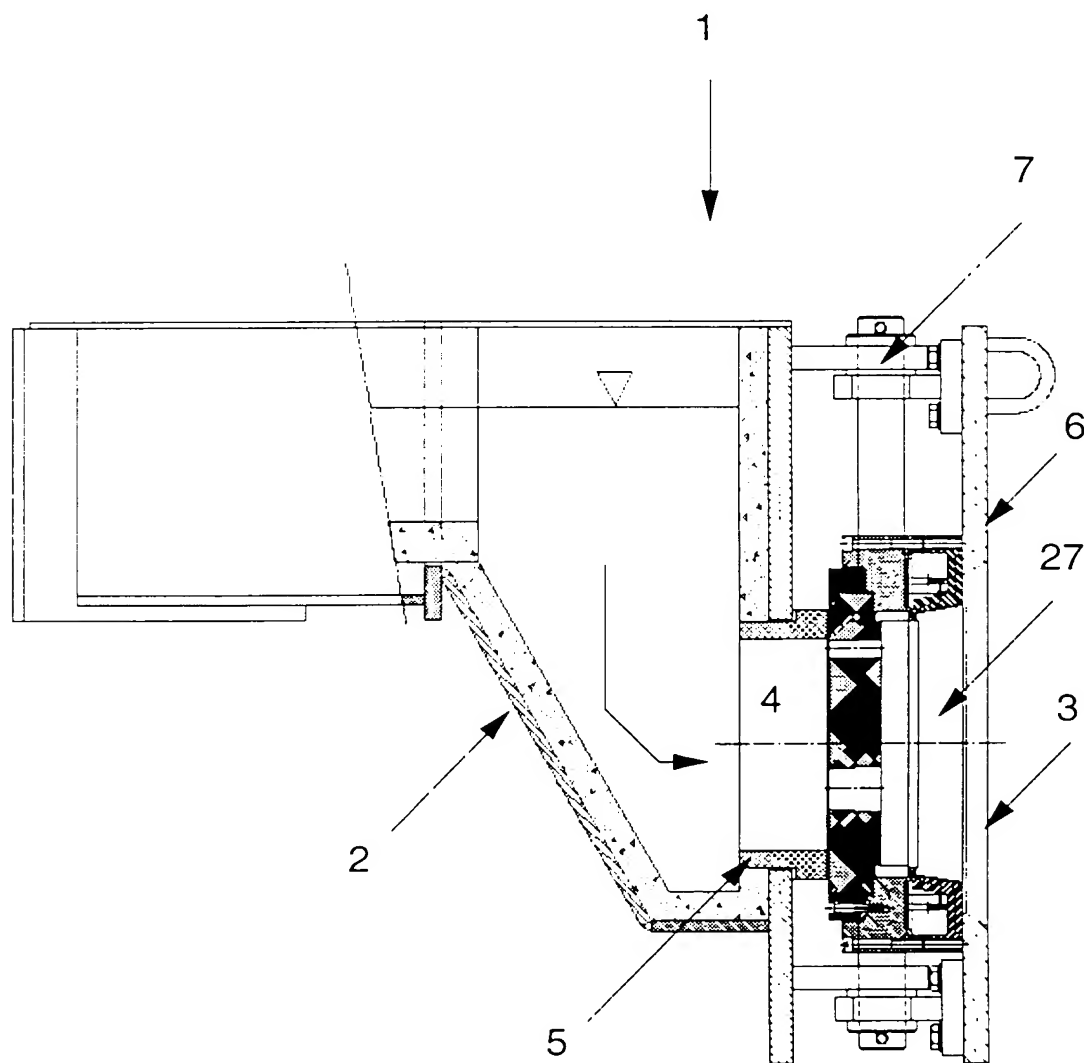
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by the International Bureau

**11 JUL 2000**

1/3

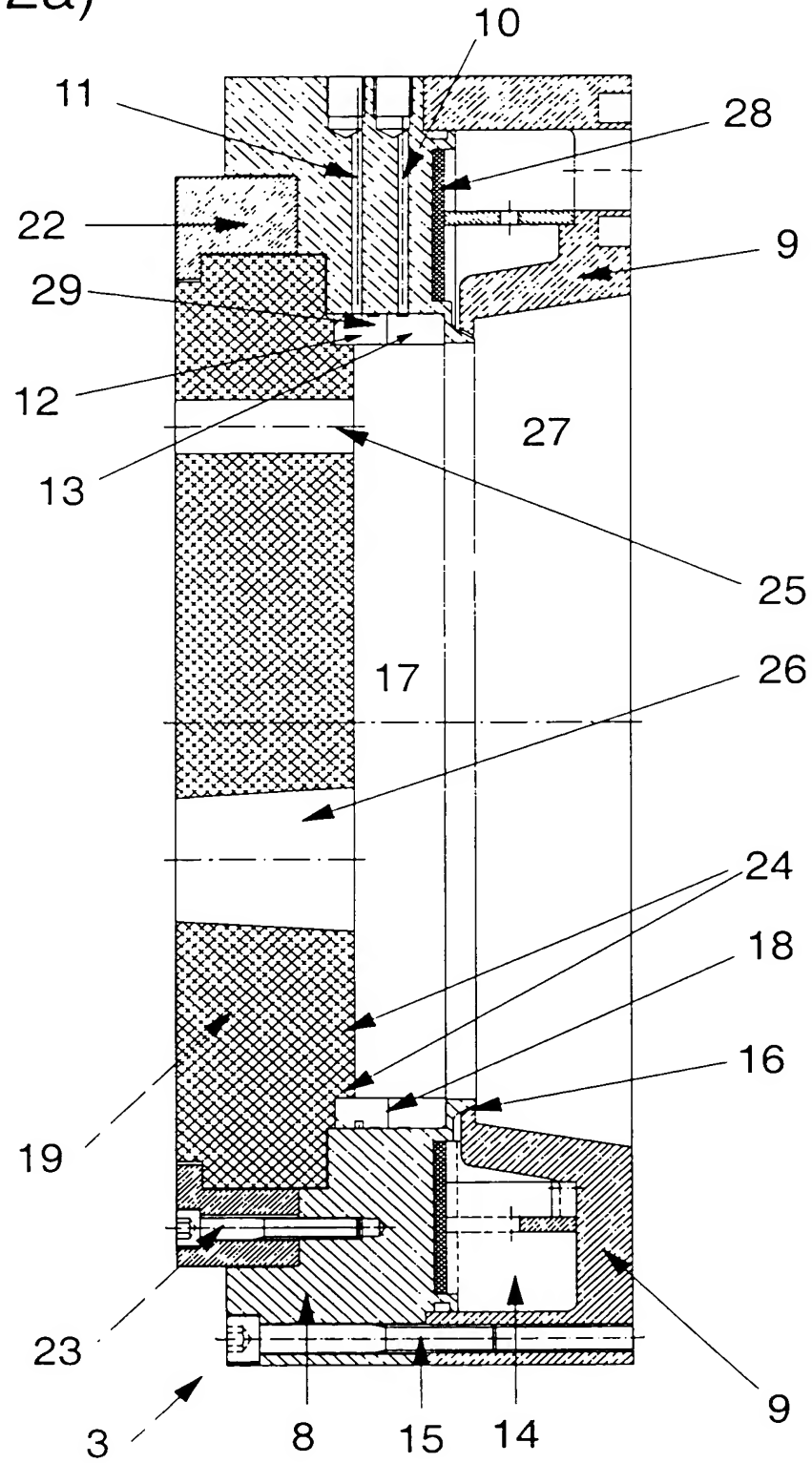
Fig. 1





2/3

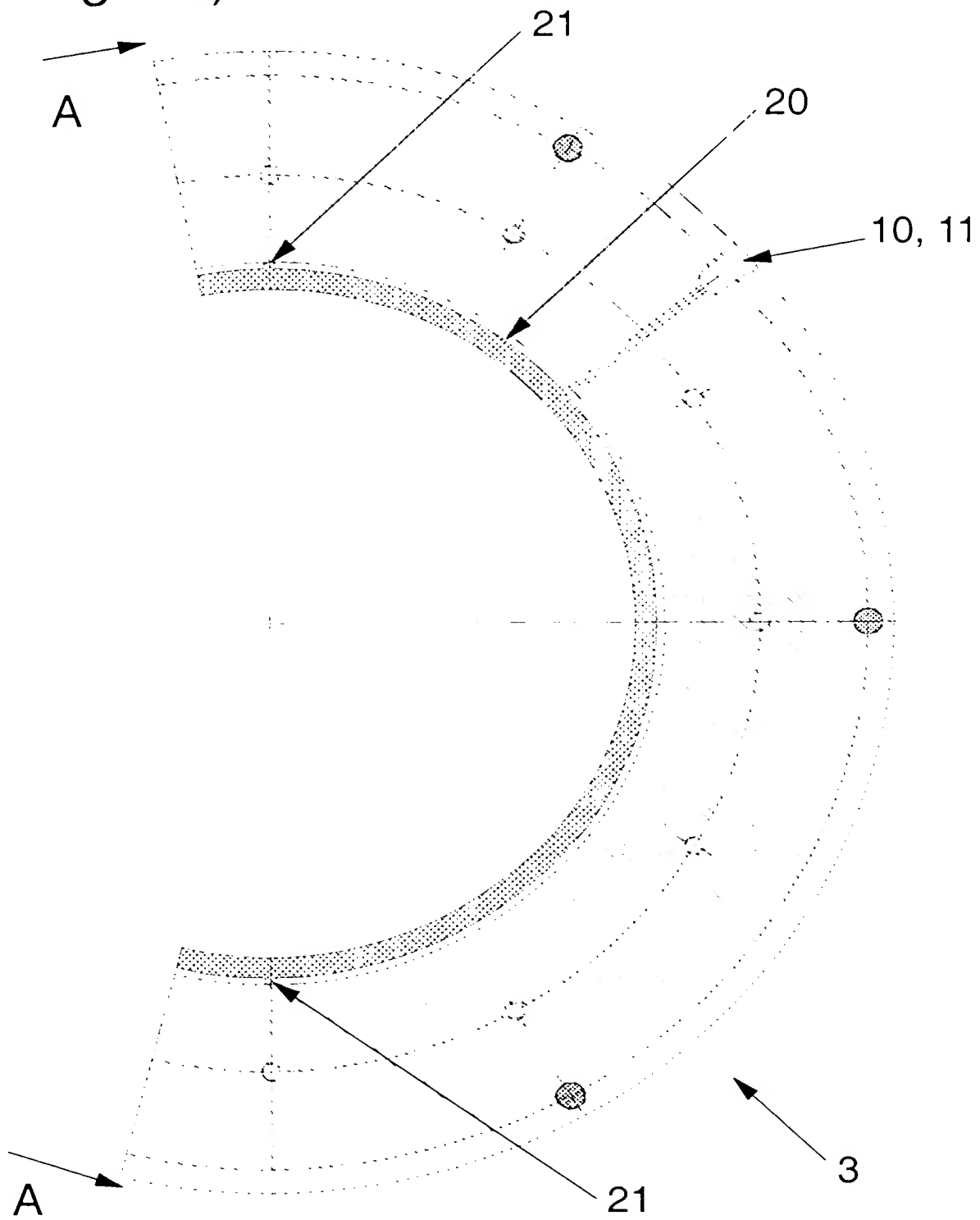
Fig. 2a)



Snitt A - A

3/3

Fig. 2b)



### Utstyr for kontinuerlig støping av metall, spesielt aluminium

Foreliggende oppfinnelse vedrører utstyr for kontinuerlig, horisontal støping av metall, spesielt aluminium, innbefattende et isolert reservoar eller kulp som er innrettet til å romme flytende metall, samt en i forhold til kulpen løstagbart anordnet støpeform med en isolerende plate med hull som kommuniserer med støpeformen, hvilken støpeform innbefatter et fortrinnsvis sirkulært formrom med veggmateriale av permeabelt materiale, f.eks. grafitt, for tilførsel av olje samt minst en langs omkretsen av formrommet anordnet ringdyse for direkte tilførsel av kjølemedie.

Som angitt ovenfor, er det altså tidligere kjent direkte kjølt horisontalt støpeutstyr for kontinuerlig støping av metall der olje tilføres gjennom formromveggen gjennom en ringspalte eller et permeabelt veggelement og har som oppgave å danne en smørende film mellom formveggen og metallet.

Selv om denne type støpeutstyr fungerer rimelig bra er kvaliteten til det støpte produkt likevel vesentlig dårligere enn for tilsvarende vertikalt støpeutstyr der det i tillegg til olje også tilføres gass gjennom formromveggen.

Ulempen med vertikalt støpeutstyr er bl.a at det omfatter et stort antall støpeformer som gjør at det er kostbart å fremstille.

Dernest er det vertikale utstyret kun innrettet til å støpe bestemte lengder i en semikontinuerlig prosess som gjør at det også er dyrt å operere.

Ved støping med horisontalt støpeutstyr benyttes kun et par støpeformer, og støpingen foregår kontinuerlig, idet passende lengder av det støpte produkt kuttes av

under støpeoperasjonen. Det kontinuerlige, horisontale støpeutstyret er således både rimelig å fremstille og rimelig å operere.

Det har vært et formål med foreliggende oppfinnelse å fremskaffe horisontalt utstyr for kontinuerlig støping av metall, spesielt aluminium, hvor kvaliteten på det støpte produkt har like god kvalitet som tilsvarende produkt støpt med vertikalt støpeutstyr.

Utstyret i henhold til oppfinnelsen er karakterisert ved at det gjennom veggmaterialet i tillegg til olje tilføres gass, idet det mellom det permeable veggmateriale og støpeformhuset er anordnet ringspalter for fordeling av gassen respektive oljen til veggmaterialet, idet ringspaltene er oppdelt i sektorer ved hjelp av plugger og tilføres oljen/gassen via separate tilførselskanaler for hver sektor, hvorved tilførselen av olje/gass kan differensieres rundt omkretsen.

Kravene 2-5 angir fordelaktige trekk ved oppfinnelsen.

Oppfinnelsen skal beskrives nærmere i det etterfølgende ved hjelp av eksempel og med henvisning til vedføyde tegninger hvor:

- Fig. 1 viser, delvis, i oppriss støpeutstyr for kontinuerlig horisontalstøping av langstrakte gjenstander, f.eks. aluminium pressbolt,
- Fig. 2 viser i større målestokk selve støpeformen vist i Fig. 1, h.h.v. a) i tverrsnitt og b) i lengdesnitt.

Som det fremgår av Fig. 1 omfatter støpeutstyret 1 i h.h.t. oppfinnelsen et isolert metallforråd eller kulp 2 og en støpeform 3. Kulpen 2 er forsynt med en sideveis anordnet åpning 4 mot støpeformen 3, hvor en forbindelsesring 5 av varmeisolerende materiale danner overgangen mellom kulpen og støpeformen 3.

Støpeformen på sin side er løstagbart festet til en holdeinnretning 6 som via en hengselforbindelse 7 gjør det mulig å svinge holdeinnretningen og dermed støpeformen 3 fra en posisjon hvor den ligger til anlegg mot forbindelsesringen 5 til en utsvinget posisjon som gjør det mulig å demontere (utskifte) eller reparere støpeformen.

Selve støpeformen som er nærmere vist i Fig. 2, innbefatter et to-delt ringformet hus, hvorav en første 8 hovedhusdel er forsynt med boringer 10,11 for tilførsel av olje, respektive gass til innenfor liggende, permeable formromringer 12,13, mens en andre husdel 9 er forsynt med en ringformet utsparing som danner en vannkjølekanal 14. De to husdelene 8 og 9 fastholdes til hverandre ved hjelp av et antall skruer 15. I sammenskrudd posisjon, som vist i figuren, dannes en skråttstilt spalte 16 mellom de to delene, slik at det under støpeoperasjonen strømmer vann fra kanalen 14 og gjennom spalten 16 langs hele periferien av det støpte produkt, like utenfor formrommets 17 utløp.

Som nevnt er det anordnet permeable ringer 12,13 som er fysisk adskilt fra hverandre ved hjelp av en pakning, tetningsstoff 18 e.l. Disse ringene danner veggen i formrommet 17.

Et viktig trekk ved oppfinnelsen består i at ringformete spalter 20 (se Fig. 2, b)) som dannes mellom støpeformhuset 8 og ringene 12,13 er forsynt med pluggar 21 (bare 2 vist på tegningen) slik at ringrommet 20 er brutt opp i sektor, to eller flere etter ønske/behov. Herved kan tilførselen av både gass og olje differensieres langs omkretsen av formrommet. Slik differensiering, spesielt av gasstilførselen, er viktig for å kunne oppnå et godt støperesultat.

Det er ellers ikke tidligere kjent å tilføre gass i formrommet i horisontalt, kontinuerlig støpeutstyr. For å drenere overskuddsgass og dermed hindre innslutning av gass i metallet under støpingen, er det derfor hensiktsmessig anordnet en boring 29 gjennom formromveggen (ringen 12). Gassen ledes gjennom boringen til et ringrom utenfor ringen 12 og videre gjennom en boring i støpeformhuset 8 (ikke nærmere vist) til friluft eller en oppsamlingsanordning for gassen.

Ved formrommets 17 innløp er det anordnet en plate 19 av varmeisolerende materiale ("hot-top") som fastholdes ved hjelp av en holdering 22 via en skrueforbindelse 23.

Idet formrommets 17 vegg, dvs. ringene 12,13, danner primærkjøleområdet under støpeoperasjonen, vil arealet av veggflaten representere en av faktorene som bestemmer kjølingen av metallet.

Den isolerende platen 19 kan, avhengig av legeringstype og ønsket primærkjøling, strekke seg noe innover (ved 24) ringen 12.

Idet platen er enkelt løstagbar, vil det være lett å skifte plate og derved støpe forskjellig typer legeringer i samme støpeform.

Støpeutstyret i h.h.t. oppfinnelsen virker ellers på følgende måte:

Flytende metall, f.eks. aluminium, fylles i kulpen 2 fra en støpeovn e.l. (ikke vist), Metallet strømmer gjennom åpningen 4 og hullene 25,26 i platen 19 til formrommet 17.

Ved begynnelsen av støpeoperasjonen er utløpet 27 i støpeformen 3 lukket ved hjelp av en bevegbare støpesko (ikke vist). Så snart metallet har fylt formrommet 17, begynner skoen å forskyve seg, samtidig som vann tilføres gjennom spalten 16 og gass og olje tilføres gjennom ringen 12,13.

Etter hvert som støpeskoen forskyver seg og metall etterfylles i formrommet via kulpen, dannes et langstrakt støpeemne. Skoen tas bort så snart støpeemnet har nådd en viss lengde. Siden støpeprosessen er kontinuerlig, kan emnet i og for seg anta hvilken som helst lengde, men hensiktsmessig kuttes emnet (ikke vist) i passende lengder for ekstrudering eller andre formål.

Som nevnt ovenfor, så er støpeutstyret innrettet for differensiert tilførsel av olje og gass rundt omkretsen.

Spesielt når det gjelder tilførselen av gass, er det funnet hensiktsmessig å tilføre samme mengde gass rundt hele omkretsen av formrommet ved oppstart av støpeprosessen. Deretter, når støpeprosessen har kommet i gang og stabilisert seg, reduseres gasstilførselen til formrommets øvre område. Hensiktsmessig kan spalten

20 for tilførsel av gass i denne sammenheng være inndelt i to sektorer, en øvre og nedre sektor, ved hjelp av pluggene 21.

For øvrig når det gjelder primærkjølingen, dvs. kjølingen gjennom ringene 12,13 i formrommet 17, er det, for å redusere kjølingen, funnet hensiktsmessig å fremstille formhuset 8 av stål, istedenfor aluminium som er vanlig. Videre for ytterligere å redusere kjølingen kan det være aktuelt å skjerme (reducere varmeoverføringen) mot kjølekanalen 14 ved å anordne en isolerende ringplate 28, f.eks. av plexiglass, på den siden av husdelen som vender mot kjølekanalen.

Oppfinnelsen slik den er definert i kravene er ikke begrenset til de utførelsesformer som er vist i tegningene og beskrevet i det foranstående, således kan det i stedet for to separat anordnet ringer 12,13 være anordnet en ring med tilførsel av olje og gass i en og samme ring.

## Patentkrav

1. Utstyr for kontinuerlig, horisontal støping av metall, spesielt aluminium, innbefattende et isolert reservoar eller kulp (2) som er innrettet til å romme flytende metall, samt en i forhold til kulpen (2), løstagbart anordnet støpeform eller kokille (3) med en isolerende plate (19) med hull (25,26) som kommuniserer med støpeformen, hvilken støpeform (3) innbefatter et fortrinnsvis sirkulært formrom (17) med en vegg (12,13) av permeabelt materiale for tilførsel av olje, samt minst en langs omkretsen av formrommet anordnet ringdyse (16) for direkte tilførsel av kjølemedie,

**karakterisert ved** at det gjennom veggmaterialet i tillegg tilføres gass, idet det mellom det permeable veggmaterialet (12,13) og støpeformhuset (8) er anordnet ringspalter (20) for fordeling av gassen respektive oljen til veggmateriale, idet hver av ringspaltene (20) er oppdelt i sektorer ved hjelp av pluggen e.l. (21) og tilføres oljen/gassen via separate tilførselskanaler (10,11) for hver sektor, hvorved tilførselen av olje/gass kan differensieres rundt omkretsen av støpeformveggen.

2. Utstyr ifølge krav 1,

**karakterisert ved** at veggmaterialet utgjøres av to fysisk ved hjelp av en pakning e.l. (18) adskilte ringer (10,11).

3. Utstyr ifølge krav 1,

**karakterisert ved** at hver av ringspaltene (20) er inndelt i to sektorer, en øvre og en nedre sektor.

4. Utstyr ifølge de foregående kravene 1-3,

**karakterisert ved** at gassen tilføres veggmaterialet i området (gjennom 12) som er beliggende nærmest platen (19), mens oljen tilføres i området (gjennom 11) beliggende lengst borte fra platen (19).



5. Utstyr ifølge de foregående kravene 1-4,

**k a r a k t e r i s e r t   v e d** at det øverst i formrommet er anordnet en dreneringskanal (29) for bortførsel av gass.

## Sammendrag

Utstyr for kontinuerlig, horisontal støping av metall, spesielt aluminium. Utstyret innbefatter et isolert reservoar eller kulp (2) som er innrettet til å romme flytende metall, samt en i forhold til kulpen (2), løstagbart anordnet støpeform eller kokille (3) med en isolerende plate (19) med hull (25,26) som kommuniserer med støpeformen. Støpeformen (3) innbefatter et fortrinnsvis sirkulært formrom (17) med en vegg (12,13) av permeabelt materiale for tilførsel av olje, samt minst en langs omkretsen av formrommet anordnet ringdyse (16) for direkte tilførsel av kjølemedie. Gjennom veggmaterialet, i tillegg til oljen, tilføres gass, idet det mellom det permeable veggmaterialet (12,13) og støpeformhuset (8) er anordnet ringspalter (20) for fordeling av gassen respektive oljen til veggmaterialet. Hver av ringspaltene (20) er oppdelt i sektorer ved hjelp av plugger e.l. (21) og tilføres oljen/gassen via separate tilførselskanaler (10,11) for hver sektor, hvorved tilførselen av olje/gass kan differensieres rundt omkretsen av støpeformveggen.

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>P9948</b>	<b>FOR FURTHER ACTION</b>	see Notification of Transmittal of International Search Report Form PCT/ISA 2201 as well as, where applicable, items below.
International application No. <b>PCT/NO 00/00221</b>	International filing date <i>(day, month, year)</i> <b>26 June 2000</b>	(Earliest) Priority Date <i>(day, month, year)</i> <b>25 June 1999</b>
Applicant <b>Norsk Hydro ASA et al</b>		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of **3** sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).
2. ☐ Unity of invention is lacking (See Box II).
3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing
 

☐ filed with the international application.  
☐ furnished by the applicant separately from the international application.  

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ transcribed by this Authority.
4. With regard to the title, ☒ the text is approved as submitted by the applicant.  
☐ the text has been established by this Authority to read as follows:
5. With regard to the abstract,
 

☒ the text is approved as submitted by the applicant.  
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the **drawings** to be published with the abstract is:  
 Figure No. **1**

☒ as suggested by the applicant.  
☐ because the applicant failed to suggest a figure.  
☐ because this figure better characterizes the invention.

☐ None of the figures.

1

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 00/00221

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B22D 11/04, B22D 11/07

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B22D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	NO 302804 B (NORSK HYDRO ASA), 27 April 1998 (27.04.98), page 3, line 14 - page 5, line 12, figure 2, abstract --	1-5
Y	US 3556197 A (J.J. FOYE), 19 January 1971 (19.01.71), column 1, line 10 - line 70, claims 1-7, figures --	1-5
A	US 2690600 A (B. TARMANN ET AL), 5 October 1954 (05.10.54), figure 2, claim 1 --	1-5

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

- A document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- I document which may throw doubts on priority claim(s) or which is cited to establish the publication date of an other citation or other special reason (as specified)
- C document referring to an oral disclosure, use, exhibition or other means
- P document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 Sept. 2000

Date of mailing of the international search report

11-10- 2000

Name and mailing address of the ISA

Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. + 46 8 666 02 86

Authorized officer

Ulf Nyström / MRo  
Telephone No. + 46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 00/00221

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4688624 A (K. SUZUKI ET AL), 25 August 1987 (25.08.87), column 6, line 1 - column 7, line 7, figures 4-6  -- -----	1-5

# INTERNATIONAL SEARCH REPORT

Information on patent family members

01/08/00

International application No.

PCT/NO 00/00221

Patent document cited in search report			Publication date	Patent family members		Publication date
NO	302804	B	27/04/98	AU	694676 B	23/07/98
				AU	6217596 A	13/03/97
				CA	2184668 A	09/03/97
				CN	1157763 A	27/08/97
				FR	2738509 A,B	14/03/97
				IL	119098 D	00/00/00
				NO	953545 A	10/03/97
				RU	2141883 C	27/11/99
				US	5915455 A	29/06/99
US	3556197	A	19/01/71	DE	1758964 A	01/04/71
				FR	1579849 A	29/08/69
				GB	1245836 A	08/09/71
US	2690600	A	05/10/54	NONE		
US	4688624	A	25/08/87	AU	560021 B	26/03/87
				AU	3388084 A	20/03/86
				DE	3526689 A,C	06/02/86
				FR	2568153 A,B	31/01/86
				GB	2163685 A,B	05/03/86
				JP	1907391 C	24/02/95
				JP	6035030 B	11/05/94
				JP	61033735 A	17/02/86
				NZ	209807 A	12/11/86
				US	4653571 A	31/03/87
				JP	1795418 C	28/10/93
				JP	5004170 B	19/01/93
				JP	61071157 A	12/04/86

# PATENT COOPERATION TREATY

WO 01/00352  
PCT/NO00/00221

P991048 PCT

PCT

## NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

HOFSETH, Svein  
Norsk Hydro ASA  
N-0240 Oslo  
NORVÈGE

Date of mailing (day/month/year) 04 January 2001 (04.01.01)		
Applicant's or agent's file reference P9948		IMPORTANT NOTICE
International application No. PCT/NO00/00221	International filing date (day/month/year) 26 June 2000 (26.06.00)	Priority date (day/month/year) 25 June 1999 (25.06.99)
Applicant NORSK HYDRO ASA et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
AU, KP, KR, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE, AL, AM, AP, AT, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EA, EE, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, OA, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 04 January 2001 (04.01.01) under No. WO 01/00352

### REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

### REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.83.38
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# PATENT COOPERATION TREATY

# PCT

REC 10 OCT 2001

WIPO PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference <b>P9948</b>		<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. <b>PCT/NO00/00221</b>	International filing date (day/month/year) <b>26/06/2000</b>	Priority date (day/month/year) <b>25/06/1999</b>	
International Patent Classification (IPC) or national classification and IPC <b>B22D11/04</b>			
Applicant <b>NORSK HYDRO ASA et al.</b>			

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 6 sheets, including this cover sheet.
  - ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of    sheets.

- This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  <b>17/01/2001</b>	Date of completion of this report  <b>05.10.2001</b>
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel: +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  <b>Lombois, T</b>  Telephone No. +49 89 2399 7444  



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/NO00/00221

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-5 as published

**Claims, No.:**

1-5 as published

**Drawings, sheets:**

1/3-3/3 as published

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NO00/00221

☐ the drawings.          sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes: Claims 1-5
	No: Claims
Inventive step (IS)	Yes: Claims
	No: Claims 1-5
Industrial applicability (IA)	Yes: Claims 1-5
	No: Claims

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/NO00/00221

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

**D1:** US-A-3556197, (KAISER Aluminium), 19 January 1971

**D2:** US-A-4420030, (OLIN Corp.), 13 December 1983

Note: the document D2 was not cited in the international search report.

1. The document **D1** is regarded as being the closest prior art to the subject-matter of claim 1, and insofar as this claim can be understood (see Section VIII), this document shows the following features thereof (Claim 1 is cited in italics, the references in parentheses applying to the prior art document D1):

*Equipment for continuous, horizontal casting of metal, in particular aluminium, the equipment including an insulated reservoir or pool (10), which is designed to contain liquid metal, and a mould (12), which can be removed from the pool (10), with an insulating plate (11) with holes (orifice, cf figures) which communicate with the mould, the mould (12) including a preferably circular cavity (embodiments 1-4,6)*

*and at least one annular slit or nozzles (not shown) arranged along the circumference of the cavity for the direct supply of coolant (cf direct cooling mentioned on col.2, l.60-63: "Additional water sprays from the spray equipment (not shown) may be directed to impinge against the outer surface of the ingot emerging from the exit of the [chilled] mold section 12"),*

**The subject-matter of claim 1** therefore **differs from this known equipment** for continuous, horizontal casting of metal **in that** (hereafter the references in parentheses are applying to the present application)

*[the cavity of the mould includes] a wall (12,13) of permeable material for the supply of oil and in that*

*in addition to the oil, gas is supplied through the permeable material (12,13)*

*and in that*

*annuli (20) are arranged between the permeable wall material and the mould housing (8) to distribute the gas/oil to the wall material where the annuli (20) is divided into sectors using plugs or similar restrictions (21) and are supplied with oil/gas via*

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

---

International application No. PCT/NO00/00221

*separate supply channels (10,11) for each sector, thus making it possible to differentiate the supply of oil/gas around the circumference.*

It is clear from the description on page 2, two first paragraphs, that **the alleged object of the equipment** for horizontal continuous casting of metal **claimed** in claim 1 **is to provide for a differentiated supply of oil/gas around the circumference of the mould cavity.**

**However, document D1** cited in the search report **seems to address the same technical problem** (cf col.1, l.25-32 and in particular various embodiments n°1,3,4 and 6 respectively on col.4, l.69-71 / col.5, l.15-18 / col.5, l.55-57 / col.7, l.28-30) **and provides for the a differentiated supply of oil/gas** around the circumference of the mould cavity.

Consequently, insofar as this claim can be understood (see Section VIII), **it does not seem that the subject-matter of claim 1 involves an inventive activity over the disclosure of D1, the design of the wall of the cavity of the mould being a matter of constructional details.**

2. For the sake of completeness, it has to be pointed out that also **D2 seems to be a base for an analogous argumentation.**

3. In view of the documents cited in the search report, **also the dependent claims do not seem to contain inventive subject-matter.** In particular, all the features disclosed in addition to those of related independent claims, are derivable from the cited documents (see for example claim 3 upper and lower sectors) and/or usual in the art (see for example providing gas close to the insulating plate in claim 4).

**Re Item VII    Certain defects in the international application**

**A document reflecting the prior art described on page 1 first and second paragraph is not identified in the description.** If the applicant is aware of a document reflecting the prior art which would be a basis for the preamble of independent claim 1 and which is not cited in the search report, then this document should have been identified in the description (**Rule 5.1(a)(ii) PCT**).

**Re Item VIII** Certain observations on the international application

1. **Claim 1 does not meet the requirements of Article 6 PCT** in that the matter for which protection is sought is not clearly defined.

Actually the characterising portion is focusing on the design of the wall of the cavity of the mould which is alleged to make it possible to differentiate the supply of oil/gas around the circumference. Claim 1 mentions successively that:

- the mould includes a cavity with a wall (12,13) of permeable material for the supply of oil,
- annuli (20) are arranged between the permeable wall material and the mould housing (8) to distribute the gas/oil to the wall material,
- the annuli is divided into sectors using plugs or similar restrictions (21).

**It is not clear which are the structural features of the wall of the cavity of the mould.**

On one hand the wall is said to be formed from the permeable rings (12,13) (cf description p.3, 2nd paragraph) and on the other hand annuli are reputed to be arranged between the mould housing and the said rings (cf claim 1 and description p.3, paragraph starting with "An important feature..."). However when comparing the cross section view (fig. 2 a) and the longitudinal section view (fig. 2 b) of the mould is cannot be understood if the permeable rings (12,13) are different from the annuli since on the longitudinal section view (fig. 2 b) of the mould there is no permeable ring shown and on the cross section view (fig. 2 a) of the mould there is no annulus (20) shown. The text of the description does not provide for any clarification.

2. According to the requirements of **Rule 10.2 PCT**, **the terminology and the signs shall be consistent throughout the application. This requirement is not met** in view of:

- a) the use of references 10 and 11 to designate rings in claim 2,  
(Actually, in the description the cited references designate drilled holes and permeable rings are referenced 12 and 13),
- b) the references 12 and 11 used in claim 4 are probably erroneous.

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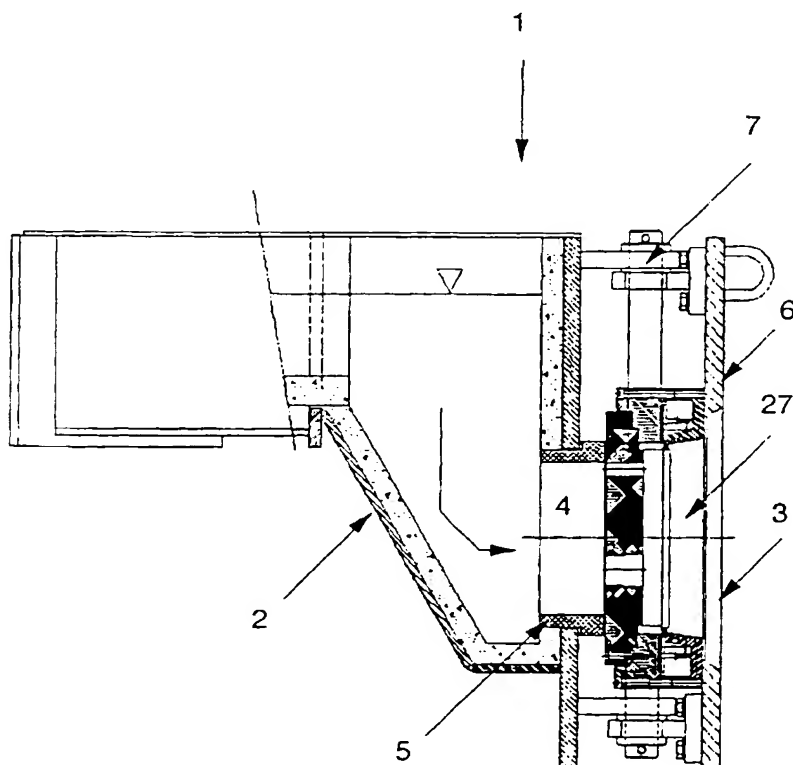
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[Continued on next page]

(54) Title: EQUIPMENT FOR CONTINUOUS, HORIZONTAL CASTING OF METAL



(57) Abstract: Equipment for continuous, horizontal casting of metal, in particular aluminium. The equipment including an insulated reservoir or pool (2), which is designed to contain liquid metal, and a mould (3), which can be removed from the pool (2), with an insulating plate (19) with holes (25, 26) which communicate with the mould, the mould (3) including a preferably circular cavity (17) with a wall (12, 13) of permeable material for the supply of oil and at least one annular slit or nozzles (16) arranged along the circumference of the cavity for the direct supply of coolant. In addition to the oil gas, is supplied through the permeable material (12, 13) and annuli (20) are arranged between the permeable wall material and the mould housing (8) to distribute the gas/oil to the wall material. The annuli (20) is divided into sectors using plugs or similar restrictions (21) and are supplied with oil/gas via separate supply channels (10, 11) for each sector, thus making it possible to differentiate the supply of oil/gas around the circumference.

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— With international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# EQUIPMENT FOR CONTINUOUS, HORIZONTAL CASTING OF METAL.

The present invention concerns equipment for continuous, horizontal casting of metal, in particular aluminium, including an insulated reservoir or pool, which is designed to contain liquid metal, and a mould, which can be removed from the pool, with an insulating plate with holes which communicate with the mould. The mould includes a preferably circular cavity with wall material of permeable material, for example graphite, for the supply of oil and at least one tubular die arranged along the circumference of the cavity for the direct supply of coolant.

As stated above, directly cooled horizontal casting equipment for continuous casting of metal in which oil is supplied through the cavity wall through an annulus or a permeable wall element in order to form a lubricant film between the mould wall and the metal is already known.

Although this type of casting equipment functions reasonably well, the quality of the cast product is, however, much poorer than that of equivalent vertical casting equipment in which, in addition to oil, gas is also supplied through the cavity wall.

One of the disadvantages of vertical casting equipment is that it comprises a large number of moulds. This makes it expensive to produce.

Moreover, the vertical equipment is only designed to cast specific lengths in a semi-continuous process. This also makes it expensive to operate.

Casting with horizontal casting equipment involves the use of only a few moulds and the casting takes place continuously. Suitable lengths of the cast product are cut off during the casting operation. The continuous, horizontal casting equipment is thus both cheap to produce and cheap to operate.



One aim of the present invention was to produce horizontal equipment for continuous casting of metal, in particular aluminium, with which the quality of the cast product is as good as the quality of the equivalent cast product with vertical casting equipment.

The equipment in accordance with the present invention is characterised in that gas in addition to oil is supplied through the permeable wall material and that annuli are arranged between the permeable wall material and the mould housing to distribute the gas/oil to the wall material and that the annuli are divided into sectors using plugs and are supplied with oil/gas via separate supply channels for each sector, whereby the supply of oil/gas may be differentiated around the circumference of the mould cavity.

Claims 2-5 define the advantageous features of the present invention.

The present invention will be described in the following in further detail by way of examples and with reference to the attached drawings, where:

Fig. 1 shows, in part, in an elevation, the casting equipment for continuous horizontal casting of long objects, for example aluminium billets.

Fig. 2 shows, in large scale, the mould shown in Fig. 1, a) in cross-section and b) in a longitudinal section.

As Fig. 1 shows, the casting equipment 1 in accordance with the present invention comprises an insulated metal reservoir or pool 2 and a mould 3. The pool 2 is provided with a lateral opening 4 to the mould 3, where a connecting ring 5 of thermally insulating material forms the transition between the pool and the mould 3.

On its side, the mould is releasably attached to a holding device 6. Via a hinge link 7, it is possible to swing the holding device and thus the mould 3 from a position in which it is in contact with the connecting ring 5 to a swung-out position which makes it possible to remove (replace) or repair the mould.

The mould itself, which is shown in further detail in Fig. 2, comprises a two-part annular housing, of which a first main housing part 8 is provided with drilled holes 10,11 for the supply of oil or gas to interior, permeable cavity rings 12,13, while a

second housing part 9 is provided with an annular recess which forms a water cooling channel 14. The two housing parts 8 and 9 are held together by means of a number of screws 15. When they are screwed together, as shown in the figure, a diagonal gap 16 is formed between the two parts so that, during the casting operation, water flows from the channel 14 and through the gap 16 along the entire periphery of the cast product just outside the outlet of the cavity 17.

As mentioned, permeable rings 12, 13, which are physically separated from each other by a gasket, sealing material 18 or similar, are included. These rings form the wall in the cavity 17.

An important feature of the present invention is that the annuli 20 (see Fig. 2, b)) formed between the mould housing 8 and the rings 12, 13 are provided with plugs 21 (only 2 shown in the drawing) so that the annuli 20 are broken up into two or more sectors as required. In this way, the supply of both gas and oil can be differentiated along the circumference of the cavity. Such differentiation, in particular of the gas supply, is important in order to be able to achieve a good casting result.

Supply of gas to the mould cavity of horizontal casting equipment is not previously known. To enable drainage of excess gas and thereby avoid inclusion of gas in the cast metal product under the casting process a bore 29 is provided through the mould wall (the ring 12). The gas is led to an annulus outside the ring 12 and further through a bore in the housing 8 (not further shown) to the atmosphere or a suitable collecting tank or the like for the gas.

At the inlet of the cavity 17, there is a plate 19 of thermally insulating material ("hot-top") which is held in place using a retaining ring 22 via a screw connection 23.

As the wall of the cavity 17, i.e. the rings 12, 13, forms the primary cooling area during the casting operation, the area of the wall surface will represent one of the factors which determine the cooling of the metal.

The insulating plate 19 may, depending on the type of alloy and the primary cooling required, extend along the ring 12 (at 24) somewhat.

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As the plate can be easily detached, it will be easy to replace the plate and thus cast different types of alloy in the same mould.

Otherwise, the casting equipment in accordance with the present invention works as follows:

Liquid metal, for example aluminium, is poured into the pool 2 from a casting furnace or similar (not shown). The metal flows through the opening 4 and the holes 25, 26 in the plate 19 into the cavity 17.

At the beginning of the casting operation, the outlet 27 in the mould 3 is closed using a mobile casting shoe (not shown). As soon as the metal has filled the cavity 17, the shoe begins to move, while water is supplied through the gap 16 and gas and oil are supplied through the ring 12, 13.

As the casting shoe moves and the cavity is refilled with metal via the pool, a long casting piece is formed. The shoe is removed as soon as the casting piece has reached a certain length. Since the casting process is continuous, the casting piece may actually be of any length. However, it is expedient for the casting piece to be cut (not shown) into suitable lengths for extrusion or other purposes.

As mentioned above, the casting equipment is designed for differentiated supply of oil and gas around the circumference.

In particular regarding the supply of gas, it has been found expedient to supply the same quantity of gas around the entire circumference of the cavity at the start of the casting process. Subsequently, when the casting process has started and has become stable, the gas supply to the upper area of the cavity is reduced. Preferably, in this connection the annuli 20 for the supply of gas may be divided into two sectors, an upper and lower, by means of restrictions 21.

Moreover, regarding the primary cooling, i.e. the cooling through the rings 12, 13 in the cavity 17, it has been found expedient, in order to reduce the cooling, to make the mould housing 8 of steel instead of aluminium, which is the usual material. Furthermore, in order to reduce the cooling further, it may be necessary to shield (reduce the thermal transfer to) the cooling channel 14 by arranging an insulating annular plate 28, for example of Plexiglas, on the side of the housing part which faces the cooling channel.

The invention as defined in the claims is not restricted to the embodiments shown in the drawings and described above, thus, instead of using two independent rings 12,13 just one ring may be employed for the supply of oil and gas through the same ring.

## Claims

1. Equipment for continuous, horizontal casting of metal, in particular aluminium, the equipment including an insulated reservoir or pool (2), which is designed to contain liquid metal, and a mould (3), which can be removed from the pool (2), with an insulating plate (19) with holes (25, 26) which communicate with the mould, the mould (3) including a preferably circular cavity (17) with a wall (12, 13) of permeable material for the supply of oil and at least one annular slit or nozzles (16) arranged along the circumference of the cavity for the direct supply of coolant,

**characterised in** that in addition to the oil gas is supplied through the permeable material (12,13) and that annuli (20) are arranged between the permeable wall material and the mould housing (8) to distribute the gas/oil to the wall material where the annuli (20) is divided into sectors using plugs or similar restrictions (21) and are supplied with oil/gas via separate supply channels (10, 11) for each sector, thus making it possible to differentiate the supply of oil/gas around the circumference.

2. Equipment in accordance with claim 1,

**characterised in** that the wall material comprises two rings (10, 11) which are physically separated by means of a gasket (18) or similar.

3. Equipment in accordance with claim 1,

**characterised in** that each of the annuli (20) are split into two sectors, and upper and lower sector.

4. Equipment in accordance with the preceding claims 1-3,

**characterised in** that the gas is supplied through the permeable material (through 12) in the area closer to the plate 19, while the oil is supplied through the material in the area further from (through 11) the plate (19).

5. Equipment in accordance with the preceding claims 1-4,

**characterised in** that a drainage bore or channel (29) is provided in the upper part of the mould cavity to drain out excess gas.

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Fig. 1

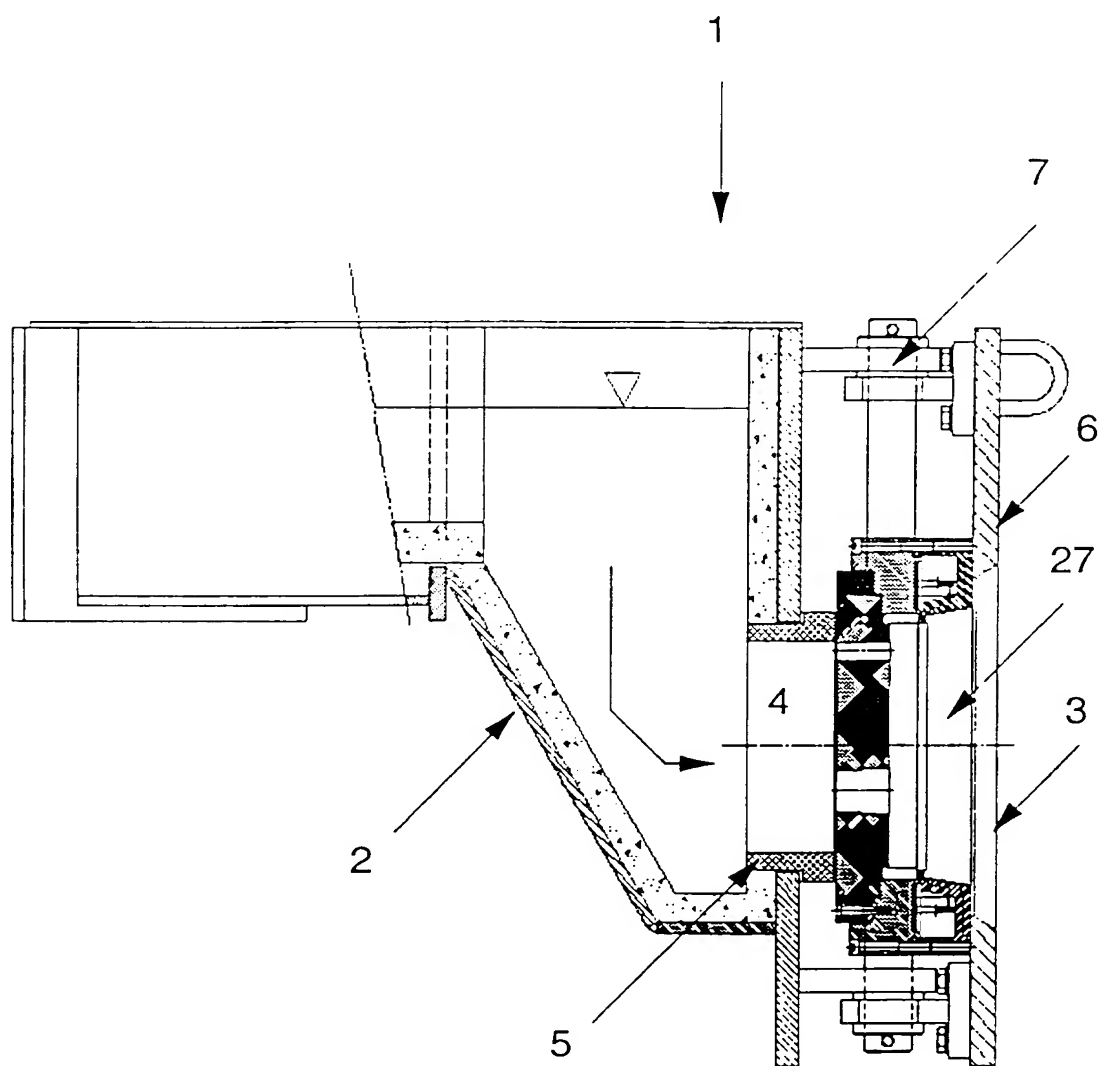
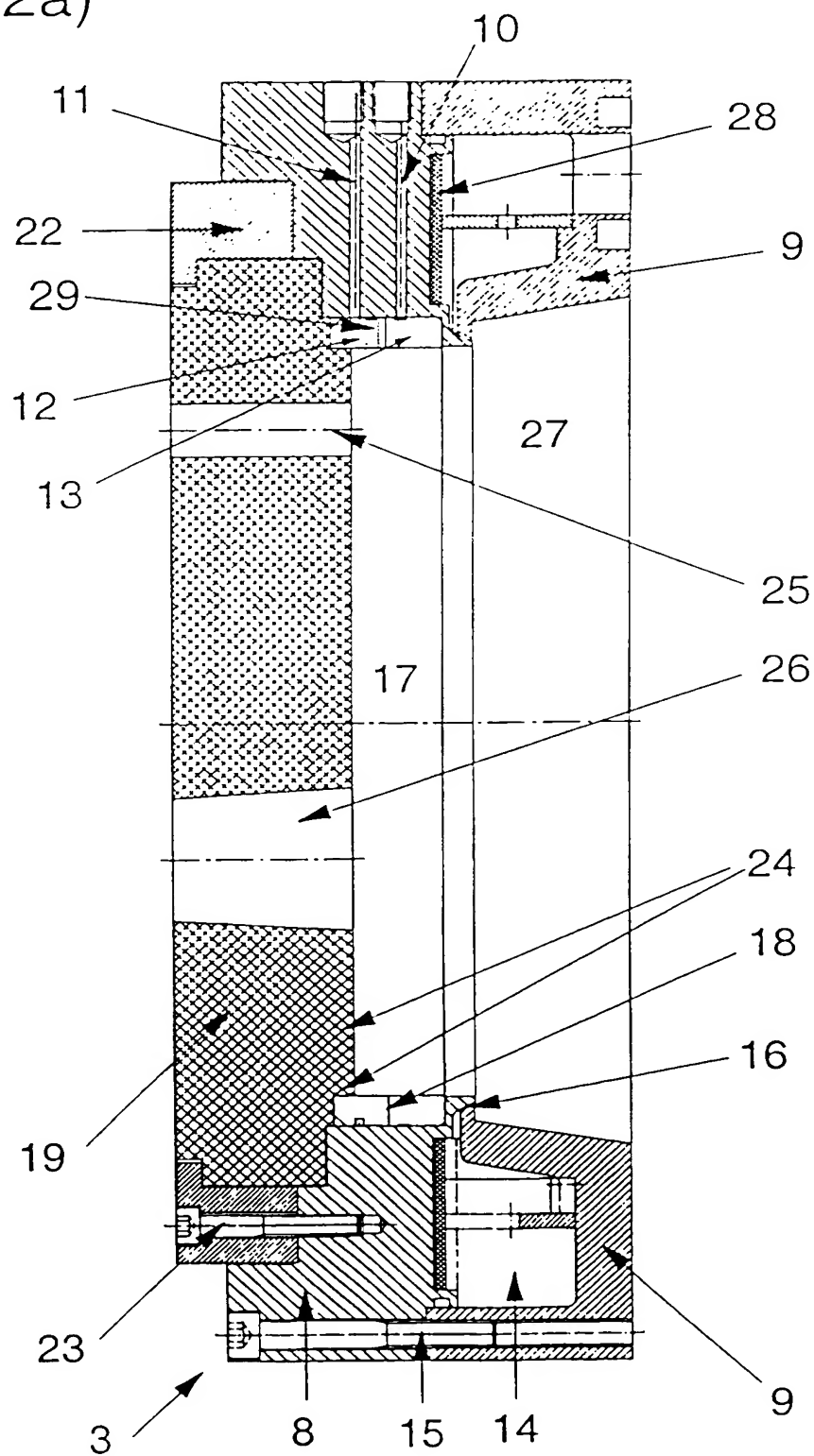


Fig. 2a)

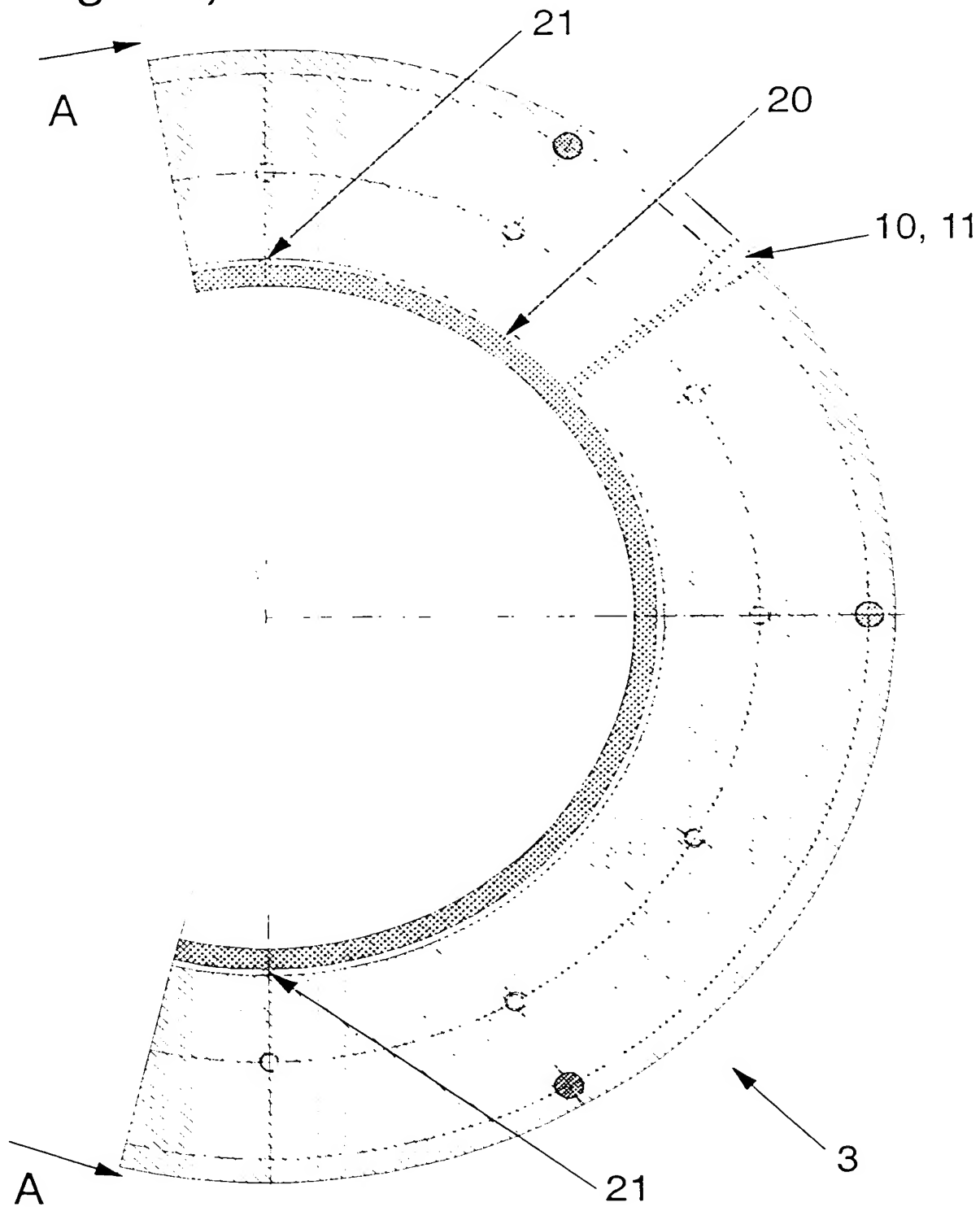
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Section A-A

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Fig. 2b)





## INTERNATIONAL SEARCH REPORT

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PCT/NO 00/00221

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B22D 11/04, B22D 11/07

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B22D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	NO 302804 B (NORSK HYDRO ASA), 27 April 1998 (27.04.98), page 3, line 14 - page 5, line 12, figure 2, abstract --	1-5
Y	US 3556197 A (J.J. FOYE), 19 January 1971 (19.01.71), column 1, line 10 - line 70, claims 1-7, figures --	1-5
A	US 2690600 A (B. TARMANN ET AL), 5 October 1954 (05.10.54), figure 2, claim 1 --	1-5

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claims) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

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## INTERNATIONAL SEARCH REPORT

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PCT/NO 00/00221

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 4688624 A (K. SUZUKI ET AL), 25 August 1987 (25.08.87), column 6, line 1 - column 7, line 7, figures 4-6</p> <p style="text-align: center;">-- -----</p>	1-5

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Information on patent family members

01/08/00

International application No.

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